

**RISK MANAGEMENT OF BRIDGE CONSTRUCTION PROJECT
IN INDONESIA**

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DEDICATION

“To Indonesia Ministry of Public Works, **Waskita**, my parents, my brother and sister, my beloved wife and sons, all families and friends”

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ABSTRACT

Risk management in bridge construction projects are considered to have more inherent risks because of the involvement of multiple contracting parties, such as owners, designers, contractors, subcontractors, and suppliers. Project delay and cost overrun are recognized as the most common problems faced by contractors, including for Bridge Construction project. To minimise these problems, identification of the most probable potential risks and the impact level of the risk can affect to the objectives the Bridge Construction project become important. The result of this research will provide preliminary data to simplify the Risk Management procedure. Research strategy to realise the objectives of this research is through document-based data collection and both quantitative and qualitative data analysis might therefore be a suitable strategy. Research data obtained from 5 Overhead Bridge construction project reports in Java Island – Indonesia, that have been completed within year 2006-2011. Sample data were analyzed quantitatively by frequency distribution analysis to obtain the objectives of the research, and complement by qualitative analysis for the risk analysis by using the Risk Analysis Matrix. Result of the research, Review Design risk recognized as the most probable risk/opportunity that affecting to Time. Subsequently, Additional Cost of Interest on Bank Loans risks as the most probable risk that affecting to Cost. And lastly, for the most probable risk that affecting in both Time and Cost is Delay in Material Procurement risk. It is also found that Construction Method Improvement is also predicted as the most probable risk/opportunity that might occur during construction. Lastly, Inaccurate Cost Estimates due to Misunderstanding of Specifications was found as the actual risk that gave Impact to the cost in one project.

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CHAPTER 1

INTRODUCTION

1.1 Background of the Studies

Risk Management is defined as a systematic planning process to identify, analyse, respond and monitor project risks. This process involves processes, tools, and techniques that will help the project manager to maximise the likelihood and produce positive events and minimise the likelihood and consequences of adverse events as indicated and appropriate in the context of risk to the overall project objectives of cost, time, scope and quality (OSPMI, 2007).

Risk management makes a major contribution to the successful completion of the construction projects on schedule, within budget and with minimised losses. Due to new challenges in the construction industry, increasing costs and greater time pressure, the probability of loss increases rapidly and led to a rising demand for comprehensive risk management (Treceno *et al.*, 2002).

As shown in Figure 1.1, the risk management plan should assure systematic risk identification, risk evaluation and proposal and implementation of risk mitigation measures.

Project risks are events or conditions of uncertainty that, if it occurs, has a positive or a negative effect on at least one project objective. A risk may have one or more causes and, if it occurs, one or more impacts (PMBOK, 2000). All risks that might effect to the cost, time or quality of the project are categorised as project risk. Project risk management purpose is to acquire better project outcomes in scheduling, cost, and operation performance (Cooper, *et al.*, 2005).



Figure 1.1. The Risk Management Process

(Source: Wannick *et al.*, 2008)

Bridges are principal and vital transportation structures. If risk management is not considered in bridge construction projects, objectives cannot be achieved on time, within budget, or with suitable quality results. Risk management in bridge construction projects are considered to have more inherent risks because of the involvement of multiple contracting parties, such as owners, designers, contractors, subcontractors, and suppliers. These factors are also involved in temporary project teams consist from different companies, countries, and cultures; moreover, the size and complexity of these projects add to uncertainties and risks (El-Sayegh, 2008).

In recent years it can be observed that the amount of losses in bridge construction projects has increased as well. Design and material failures, miscalculation and workmanship problems as well as negligence have often been identified as the cause of such losses (Heller *et al.*, 2002). The worst catastrophic may occur during bridge construction is collapse of permanent or temporary construction. The critical factors governing a catastrophic event are (Wannick *et al.*, 2008):

- Construction of large span length, high bridges
- Geological soil conditions
- Natural exposures

- Sensitivity to weather conditions
- Complicate lifting procedures (e.g., very large and heavy bridge sections to be lifted and fixed into position)
- Traffic during construction
- Design and construction errors
- False work failure
- Overturning of cranes, launch gantries etc.

Construction projects (including bridge projects) have a variety of risks due to different factors such as weather changes, cultural differences of people involved, political instability, possibility of governmental policies changes, and financial and economical problems. The number and importance of such risks depend on the size and complexity of the project. These risks lead to costs and time overrun in construction projects (Zavadkas, et al., 2010). Therefore, the potential risks that can influence the project results should be considered.

Systematic procedures for Risk Assessment and Management of construction projects are increasingly critical to minimize construction projects risks. And even though Risk Assessment is still difficult for practicing engineers to use due to the requirement of data on too many input variables, the availability of existing large quantities of data and project-specific information makes it possible to simplify the Risk Assessment procedure. (Choi & Mahadevan, 2008)

1.2 Problem Statement

The application of Risk Management method provides the opportunity for the contractor to control the occurrence and impact of risk factors and also provides better information upon which to make decisions. And it is mostly effective when first performed early in the life of the project and is a continuing responsibility throughout the project's life cycle (OSPMI, 2007). Also, as mentioned previously, the availability of existing large quantities of data can make the Risk Assessment procedure simplified.

In order to control the risk in the early stage of the project, it is necessary for the contractor to know what are the most potential risks to the objectives of the project might occur during construction period. The risks taken into account are those that impact project scope, time, cost, and quality.

1.3 Objective of the Research

Project delay and cost overrun are recognized as the most common problems faced by contractors, including for Bridge Construction project. Based on those conditions, the objectives of this study are to identify the most probable potential risks and the impact level of the risk can affect to the objectives the Bridge Construction project, in order to minimize the risks of Costs and/or Time overruns.

1.4 Research Question

Questions which arise from this research are:

- (a) What are the potential/critical risks that might occur during Bridge Construction period?
- (b) What are the impacts of these risks to the Cost and Time of the Bridge Construction Projects?

1.5 Scope of the Research

The scope of this research consists of the following matters:

- a. This research will discuss about the Risk Management process for Construction Project, especially for the most probable risk and the impact of Overhead Bridge projects in Indonesia.
- b. Review of literature data is done to give the basic principle of the importance and the procedure of the Risk Management in Construction Project.

1.6 Limitation of the Research

This research will focus on the Risk Management process from the Contractor's perspective for Overhead Bridge and Flyover projects in Indonesia with contract sum above 30 billion Rupiahs and minimum 1 year contract period. Source of data to accomplish these objectives will be based on the Construction Project Reports and other supporting data taken from several Bridge Construction Projects.

1.7 Important of the Research

Hopefully, this research will give further information about:

- (a) The Risk Management process especially for Overhead Bridge and Flyover projects in Indonesia.
- (b) The most probable potential risks and the impact level of the risk related to the cost and time completion of Overhead Bridge and Flyover projects in Indonesia.

1.8 Organization of Thesis

The study is divided into five major chapters as below:

Chapter I Introduction

This chapter is an introduction which discusses on background of the study, problem statement, objective of the study, scope of the study, importance of the study and organization of thesis.

Chapter II Literature Review

This chapter explain about the basic concept of risk management process for construction project, by using literature sources from several books and journals.

Chapter III Research Methodology

This section describes the methods and procedures used in this study. Systematic research is illustrated by the flow chart that explains each step to be passed from this research. Basic steps of the study and data collecting system explained in this section.

Chapter IV Analysis and Discussion

This chapter presents data analysis result, discussions and literature review findings of Risk Management for Bridge Construction Project as an achievement of the objective of this research. From this discussions, a proposed of comprehensive data for the most probable potential risks and the impact level of the risk for bridge construction projects can be listed out.

Chapter V Conclusion and Recommendations

Concludes the research based on its key finding and recommendations for future research.

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